Test Next Class
32.5% of term

topics:
- Be ready for anything - last test kinematics
- Dynamics - study of forces

Friction, $F_f=\mu R$ static friction can be > kinetic
R is the restoring or Normal force is perpendicular to the surface
Tension in a string is equal at each end of the string for a massless string and frictionless pulleys
Terminal velocity - when the air drag = F_g
weight is force of gravity = $F_g= mg = GMm/r^2$
g=9.81N/kg near Earth
$G=6.67x10^{-11}$ Nm^2/kg^2 universally
elastic force $F_e=-kx$
Newton's 3 laws
First - law of inertia - v constant if $F_{net}=0$
second - law of acceleration - $a=F_{net}/m$
third - action-reaction law $F_{AB}=-F_{BA}$

Work energy and power
Work = Fd is F is in the direction of d
W=change in energy
efficiency = W_{out}/W_{in} x 100%
Power, P=W/t
kinetic energy, $E_k=1/2mv^2$

E_g = mgh = keeners: -GMm/r relative to 0 at infinity

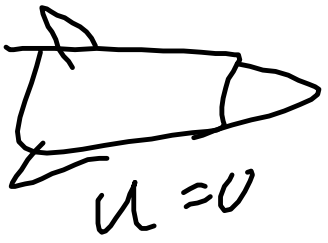
Questions from the book

p 210

Q 79 $P = \frac{W}{t} = \frac{Fd}{t} = Fv$

$= 10N \frac{50m}{10s} = \boxed{5.0W}$

Q 93 $P = 150kW$



$\rightarrow v = 268 m/s$

$P = \frac{W}{t} = \frac{Fd}{t} = \frac{mad}{t}$

$P = \frac{m\left(\frac{1}{2}(v^2 - u^2)\right)}{t}$

$t = \frac{2 \times 10^3 kg \left(\frac{1}{2}(268 m/s)^2\right)}{150 kW}$

150 kW

$t = 478.8\text{ s} = 7.98 \text{ minutes}$

$P = \frac{\Delta E_K}{t} \qquad E_K = \frac{1}{2} m v^2$

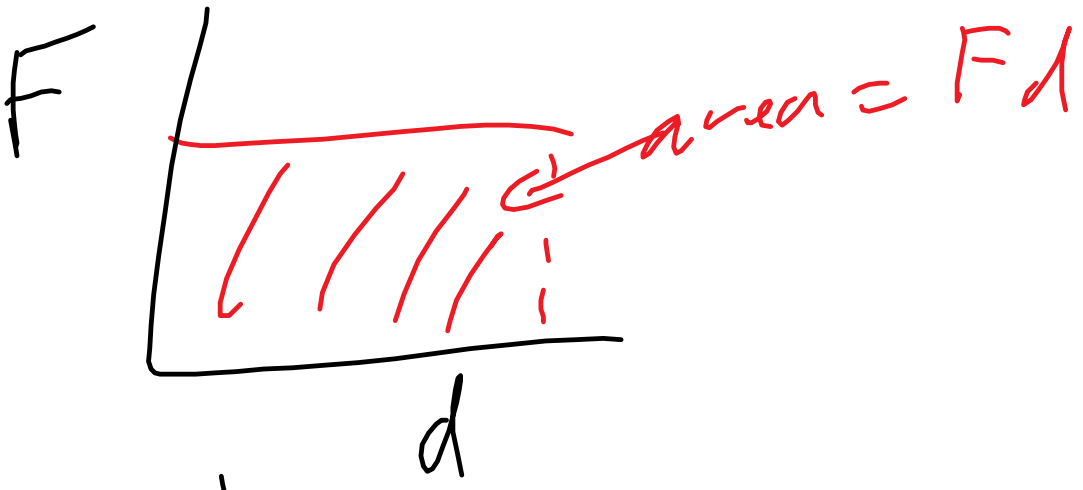
$t = \frac{\Delta E_K}{P} = \frac{\frac{1}{2} m v^2 - \frac{1}{2} m u^2}{P}$

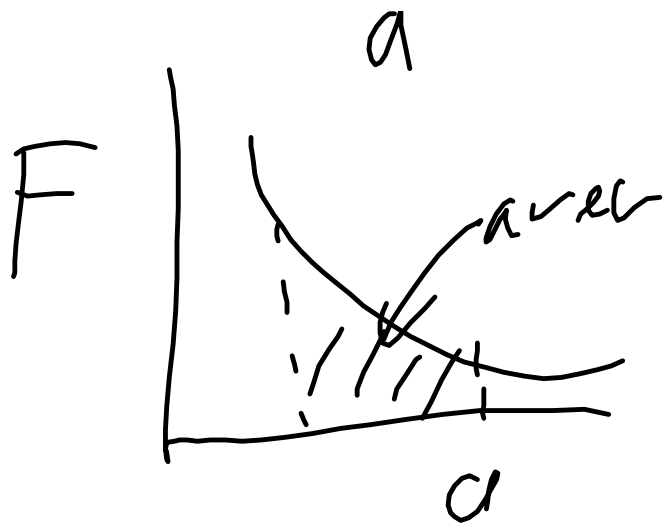
Q5 $W = Fd = mgh = \Delta E_g$

$10N (10m) = 100 J$

b) no work

c) increase 100 J.



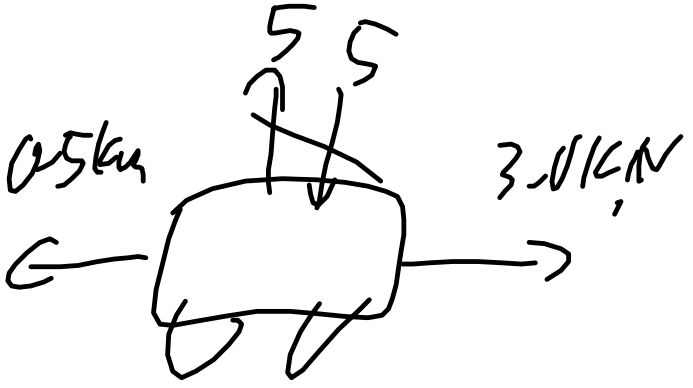


p126 – 210

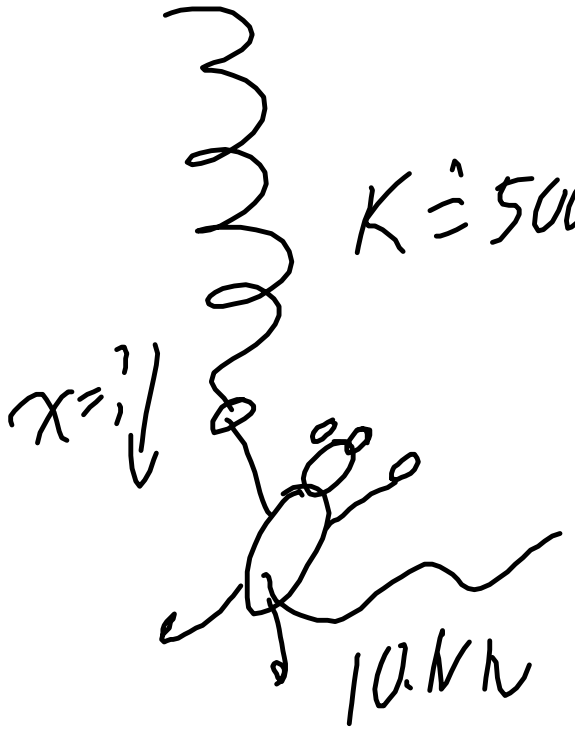
p126 Q 6,

p374 Q3, 7, 13

p172 Q 34, 40, 46, Koewns 48



$3.0kN - 0.5kN = 2.5kN$ → Forward



$F = -kx$

$x = \frac{-10N}{500 N/m}$

$x = 0.02m$ down

p172
Q34

$F_{g_1} = \frac{GM_m}{r_E^2} \propto \frac{1}{r^2}$

$F_{g_2} = \frac{GM_m}{(2r_E)^2} = \frac{1}{4}\left(\frac{GM_m}{r_E^2}\right)$

$F_{g_2} = \frac{1}{4} F_{g_1}$

$$r = 4r_E + r_E = 5r_E$$

$$\frac{6.67\times10^{-11}\,(1\text{kg})(5.98\times10^{24})}{(5\times 6.38\times10^{6})^2}$$